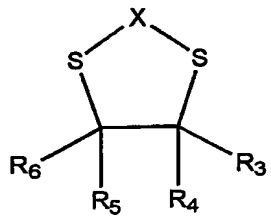
CLAIMS

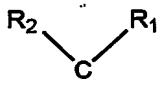
1. A method of forming a SAM on at least one surface of a substrate by application to said surface of a 2-mono-, or 2,2-disubstituted 1,3-dithiacyclopentane so as to form a SAM prepared therefrom on said surface.

2. A method of forming a SAM on at least one surface of a substrate by application to said surface of a compound of formula (I) so as to form a SAM prepared therefrom on said surface



(I)

where X can represent either



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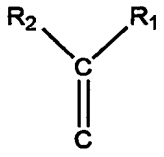


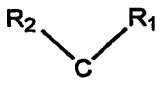
wherein

one of R_1 and R_2 can represent hydrogen and at least one of R_1 and R_2 independently represents a hydrocarbon or halogenated hydrocarbon

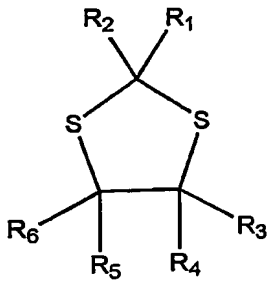
containing group, optionally provided with a selected functionality that can bind a selected biological or chemical species, or at least one of R_1 and R_2 can comprise a selected biological or chemical species directly or indirectly attached to the 1,3-dithiacyclopentane ring of a compound of formula (I), which selected biological or chemical species is such as to be suitable for immobilization to said surface further to binding of the 1,3-dithiacyclopentane ring, or a derivative thereof, to said surface; and

R_3, R_4, R_5 and R_6, are selected from the group consisting of hydrogen, halogen, $-R_a$, $-OR_a$, $-SR_a$, $-NR_aR_b$, wherein R_a and R_b can independently represent hydrocarbon which includes straight chained, branched and cyclic aliphatic and aromatic groups; or (i) R_3 and R_4, and / or (ii) R_5 and R_6, together respectively represent =O.

3. A method according to claim 2, wherein X represents



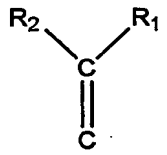
and whereby the SAM is formed by application to at least one surface of the substrate of a compound of formula (Ia)



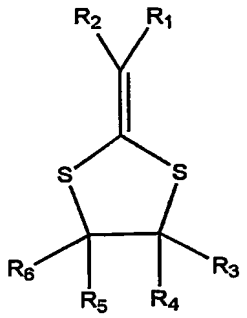
(Ia)

where R_1 to R_6 are as defined in claim 2.

4. A method according to claim 2, wherein X represents



and whereby the SAM is formed by application to at least one surface of the substrate of a compound of formula (Ib)



(Ib)

where R_1 to R_6 are as defined in claim 2.

5. A method according to any of claims 2 to 4, wherein R_1 represents hydrogen and R_2 represents a hydrocarbon or halogenated hydrocarbon containing group.

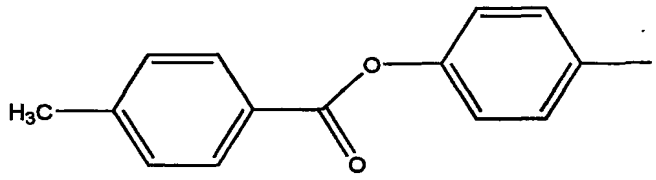
6. A method according to claim 5, wherein R_1 represents hydrogen and R_2 represents alkyl, or aryl, which in turn may be further substituted.

7. A method according to claim 6, wherein R_1 represent hydrogen and R_2 represents an alkyl group of up to 20 carbon atoms.

8. A method according to claim 7, wherein R_2 represents $-(CH_2)_{16}CH_3$.

9. A method according to claim 6, wherein R_1 represent hydrogen and R_2 represents optionally substituted phenyl.

10. A method according to claim 9, wherein R_2 represents the following substituent

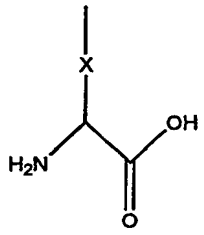


11. A method according to any of claim 2 to 4, wherein R_1 represents hydrogen and R_2 represents a hydrocarbon or halogenated hydrocarbon containing group, provided with said selected functionality that can bind a selected biological or chemical species.

12. A method according to claim 11, wherein said selected functionality allows one or more polymers, dendrimers or biomolecules to be bound by a compound of formula (I).

13. A method according to claim 11 or 12, wherein one of R_1 or R_2 can be provided with an amino acid functionality so as to facilitate binding of one or more biomolecules to a selected substrate.

14. A method according to claim 13, wherein one of R_1 or R_2 can represent the following substituent



where X can represent a hydrocarbon containing group.

15. A method according to claim 14, wherein X represents either alkylene linker $-(CH_2)_m-$, where m is 1 to 6, or arylene linker $-(CH_2)_n(p\text{-}C_6H_4)(CH_2)_o-$, where n and o independently represent an integer of 0 to 3.

16. A method according to any of claims 2 to 4, wherein at least one of R_1 and R_2 comprises said selected biological or chemical species directly or indirectly attached to the 1,3-dithiacyclopentane ring of a compound of formula (I).

17. A method according to any of claims 2 to 16, wherein R_3, R_4, R_5 and R_6, are selected from the group consisting of hydrogen, fluoro, chloro, $-R_c$, $-OR_c$, $-SR_c$ and $-NR_cR_d$, where R_c and R_d represent C_{1-6}alkyl or C_{2-6}alkenyl.

18. A method according to claim 17, wherein each of R_3, R_4, R_5 and R_6 represent hydrogen.

19. A method according to claim 17, wherein each of R_3, R_4, R_5 and R_6 represent halogen.

20. A method according to claim 19, wherein each of R_3, R_4, R_5 and R_6 represent fluoro.

21. A method according to any of claims 2 to 16, wherein R_3 and R_4 together represent =O, and R_5 and R_6 together represent =O.

22. A method according to any of claims 1 to 21, which further comprises providing a second material to at least one surface of the substrate.

23. A method according to claim 22, wherein the second material is provided as a SAM selectively formed in areas of the substrate surface

substantially uncovered by a first SAM formed on said surface according to any of claims 1 to 21.

24. A method according to claim 23, wherein the 1,3-dithiacyclopentane of the first SAM is chemically distinct from the molecular species of the second SAM.

25. A method according to claim 24, wherein the first SAM comprises a hydrophilic monolayer and the second SAM comprises a hydrophobic monolayer.

26. A method according to claim 22, wherein the second material is selectively applied to areas of the substrate surface substantially resembling the pattern of the first SAM formed on said surface according to any of claims 1 to 21.

27. A method according to claim 26, wherein the second material is a metal.

28. A method of microcontact printing, comprising printing a pattern on a surface of a substrate, where the pattern includes exposed regions and SAM protected regions, wherein the SAM is formed by application to at least one surface of the substrate of a 2-mono-, or 2,2-disubstituted 1,3-dithiacyclopentane, wherein the substituent at the 2 position facilitates formation of the SAM on the substrate.

29. A method according to claim 28, wherein said 1,3-dithiacyclopentane is as defined in any of claims 1 to 21.

30. A method according to claim 28 or 29, which comprises providing a patterned stamp defining the required pattern of said patterned layer; and bringing said patterned stamp loaded with an ink into contact with the surface of said substrate, said patterned stamp being arranged to deliver said ink to

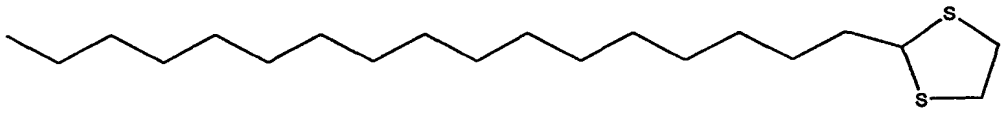
the contacted areas of the surface of said substrate; wherein said ink comprises said 2-mono-, or 2,2-disubstituted 1,3-dithiacyclopentane.

31. A method according to claim 30, wherein the stamp is formed from polydimethylsiloxane.

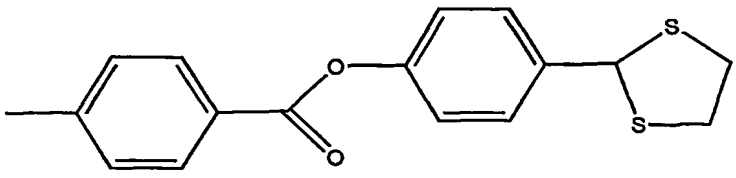
32. A method according to any of claims 1 to 31, wherein the substrate comprises a metal substrate, or at least a surface of the substrate on which said SAM is formed comprises a metal.

33. A method according to claim 32, wherein the metal is gold.

34. A method of microcontact printing, comprising printing a pattern on a surface of a substrate, where the pattern includes exposed regions and SAM protected regions, wherein the SAM is formed by application to at least one surface of the substrate of the following 2-monosubstituted 1,3-dithiacyclopentane



35. A method of microcontact printing, comprising printing a pattern on a surface of a substrate, where the pattern includes exposed regions and SAM protected regions, wherein the SAM is formed by application to at least one surface of the substrate of the following 2-monosubstituted 1,3-dithiacyclopentane



36. An ink composition for use in microcontact printing, wherein the composition comprises a 2-mono-, or 2,2-disubstituted 1,3-dithiacyclopentane, wherein the substituent at the 2 position facilitates formation of the SAM on a substrate, together with a solvent suitable for dissolving the 1,3-dithiacyclopentane.

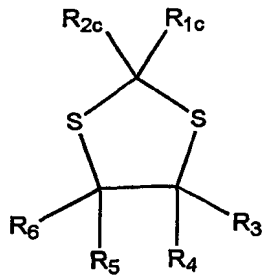
37. An ink composition according to claim 36, wherein said 2-mono-, or 2,2-disubstituted 1,3-dithiacyclopentane is as further defined in any of claims 1 to 21.

38. An ink composition according to claim 36 or 37, wherein the concentration of said 1,3-dithiacyclopentane in said solvent is less than 100mM.

39. An ink composition according to claim 38, wherein the concentration of said 1,3-dithiacyclopentane in said solvent is in the range of about 1.0 to 10.0mM.

40. An ink composition according to any of claims 36 to 39, wherein said solvent is ethanol.

41. A compound of formula (Ic)



(Ic)

where R_{1c} represents hydrogen, R_{2c} represents C_{16-25}alkyl and R_3, R_4, R_5 and R_6 are as defined in any of claims 2 and 17 to 21.

42. A compound as claimed in Claim 41, wherein R_{2c} represents a heptadecyl and wherein R_3, R_4, R_5 and R_6 represent hydrogen.

43. Use of a 2-mono-, or 2,2-disubstituted 1,3-dithiacyclopentane, wherein the substituent at the 2 position facilitates formation of the SAM on a substrate, as an ink for use in microcontact printing.

44. Use according to claim 43, wherein said 2-mono-, or 2,2-disubstituted 1,3-dithiacyclopentane is as further defined in any of claims 1 to 21.

45. Use of a 2-mono-, or 2,2-disubstituted 1,3-dithiacyclopentane, wherein the substituent at the 2 position facilitates formation of the SAM on a substrate, in the manufacture of an ink composition for use in microcontact printing, which use comprises dissolving said 1,3-dithiacyclopentane in a solvent suitable for transferring said 1,3-dithiacyclopentane to a stamping surface.

46. Use according to claim 45, wherein said 2-mono-, or 2,2-disubstituted 1,3-dithiacyclopentane is as further defined in any of claims 1 to 21.

47. Use according to claim 45 or 46, wherein said solvent is ethanol.

48. A method of preparing an ink composition for use in microcontact printing, which method comprises dissolving a 2-mono-, or 2,2-disubstituted 1,3-dithiacyclopentane, wherein the substituent at the 2 position facilitates formation of the SAM on a substrate, in a solvent suitable for transferring said 1,3-dithiacyclopentane to a stamping surface.

49. A method according to claim 48, wherein said 2-mono-, or 2,2-disubstituted 1,3-dithiacyclopentane is as further defined in any of claims 1 to 21.

50. A method according to claim 48 or 49, wherein said solvent is ethanol.

51. A kit for use in microcontact printing, which kit comprises an ink composition according to any of claims 36 to 40; a microcontact printing stamp for transferring said 2-mono-, or 2,2-disubstituted 1,3-dithiacyclopentane of said ink composition to a substrate; and a substrate suitable for receiving said 2-mono-, or 2,2-disubstituted 1,3-dithiacyclopentane of said ink composition from said stamp.

52. A patterned substrate prepared in accordance with a method according to any of claims 1 to 35.

53. A substrate provided with a pattern on at least one surface thereof, wherein the pattern includes exposed regions and SAM protected regions, wherein the SAM is formed by application to the surface of a 2-mono-, or 2,2-disubstituted 1,3-dithiacyclopentane, wherein the substituent at the 2 position facilitates formation of the SAM on the substrate.

54. A substrate according to claim 53, wherein said 2-mono-, or 2,2-disubstituted 1,3-dithiacyclopentane is as further defined in any of claims 1 to 21.

55. Use of a substrate according to any of claims 52 to 54, as an etch resist.

56. A method of etching a substrate, which method comprises providing a SAM to a substrate according to any of claims 1 to 35, and subsequently contacting the thus patterned substrate with an etching solution so as to

achieve etching in the exposed regions of the substrate substantially not protected by the previously applied SAM.

57. Use of a substrate according to any of claims 52 to 54, in the immobilization of selected chemical and biological materials thereto.

58. Use of a 2-mono-, or 2,2-disubstituted 1,3-dithiacyclopentane in the immobilization of selected chemical and biological materials to at least one surface of a substrate.

59. Use according to claim 57 or 58, wherein said biological species is selected form the group consisting of peptides, proteins, oligo- and poly-nucleic acids.

60. Use according to claim 57 or 58, wherein said chemical species is a polymer or dendrimer.